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Proceedings of the PSARC Groundfish Subcommittee Meeting, January 29, 2002

A. Cass
Groundfish Subcommittee Chair

Fisheries and Oceans Canada
Pacific Scientific Advice Review Committee
Pacific Biological Station
Nanaimo, British Columbia V9T 6N7

February 2002

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PACIFIC SCIENTIFIC ADVICE REVIEW COMMITTEE (PSARC) GROUNDFISH SUBCOMMITTEE MEETING

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SUMMARY

The PSARC Groundfish Subcommittee met January 29, 2002 at the Pacific Biological Station, Nanaimo, B.C. to review new information on the status of sablefish (*Anoplopoma fimbria*). The results of the tagging analysis and the survey and commercial catch rate time series suggest contradictory views of sablefish stock status.

- The updated tagging analysis shows a steep decline in abundance during the 1990 to 1994 period, but exhibits relative stability from 1995 to 2001, with no obvious trend or outliers, and indicates a biomass of about 37,000 t with an exploitation rate of 0.1 in 2001.
- The survey catch rate time series suggests a similar decline in abundance from 1990 to 1994. A period of stability or slow decline occurs through the mid 1990s until the influence of the 2001 survey suggests a resumption of declining abundance. This reassessment of the survey time series from the mid-1990s heightens concerns that the stock has declined over the period previously thought to be stable.
- Survey catch rates show a decline from 1990 to 2001 in seven of nine localities surveyed and at most depth strata. Catch rates observed in 2001 were the lowest in the 1990-2001 time series.
- There was no evidence that the decline in survey catch rates in 2001 was anomalous due to departures from survey procedures.
- Commercial catch rates showed trends similar to those observed in the survey data, with very low levels in 2001 for some regions. However, interpretation of the trends in the commercial CPUE is complicated by the adoption of escape rings in trap gear in 1998 and the variable baiting practices over time reported by fishers.

The available data provide no clear indication of which view of stock status should be chosen. The decline in survey catch rates could be explained by factors other than a stock decline. Similarly, the tagging analysis might possess a time-dependent bias that masks a decline in abundance or may be vulnerable due to known failures of the model assumptions.

Recruitment indices indicate that year class strengths in the 1990s were below those of the late-1970s and the 1980s. Juvenile recruitment indices indicated that there may be some above average year classes in 1998/99, but their relative size will not be evident in the fishery until approximately 2004.

The Subcommittee concluded that: 1) the population is at low levels; 2) there is no immediate conservation concern; and 3) a quota reduction is appropriate. Given no clear basis for choosing between the contradictory views of stock status, the Subcommittee recommended that the stock indicators receive an approximately equal weighting, resulting in a yield in the range of 2,100 t to 4,000 t. The Subcommittee noted that a yield of 2,800 t is near the middle of the 2,100 - 4,000 t

range and corresponds to a harvest rate 0.08 identified in the Working Paper as the upper range for an appropriate reduction. Managers may wish to use this to guide their decision. This recommendation is for the balance of the current 2001/2002 fishing season and the 2002/2003 season.

SOMMAIRE

Le Sous-comité du CEESP sur le poisson de fond s'est réuni le 29 janvier 2002 à la Station biologique du Pacifique, située à Nanaimo (C.-B.), pour examiner de nouvelles données sur l'état du stock de morue charbonnière (*Anoplopoma fimbria*). Les résultats de l'étude par marquage et les séries chronologiques des taux de capture de la pêche commerciale et des relevés donnent lieu à des interprétations contradictoires quant à l'état du stock de morue charbonnière.

- L'étude par marquage mise à jour montre que l'effectif du stock a baissé abruptement de 1990 à 1994, mais qu'il a été relativement stable de 1995 à 2001, ne présentant aucune tendance évidente ou valeur aberrante, et qu'en 2001, la biomasse se chiffrait à environ 37 000 t et le taux d'exploitation était de 0,1.
- La série chronologique des taux de capture des relevés indique une baisse semblable de l'abondance de 1990 à 1994, suivie d'une période de stabilité ou de lent déclin qui dure jusqu'à ce que le relevé de 2001 laisse croire à une reprise de la baisse de l'abondance. Cette réévaluation de la série chronologique des relevés pour le milieu des années 1990 accroît les préoccupations quant à un déclin du stock pendant la période où l'on croyait que l'abondance était stable.
- De 1990 à 2001, les taux de capture des relevés ont baissé dans sept des neuf endroits échantillonnés et à la plupart des strates de profondeur. Les taux de capture observés en 2001 était les plus faibles de la série chronologique allant de 1990 à 2001.
- Rien n'indique que la baisse des taux de capture des relevés en 2001 constituait une anomalie attribuable à des procédures de relevé mal suivies.
- Très faibles en 2001 dans certaines régions, les taux de capture de la pêche commerciale présentent des tendances semblables à celles des données de relevés. Toutefois, l'ajout d'anneaux de sortie aux engins en 1998 et les modifications des pratiques d'amorçage au fil du temps compliquent l'interprétation des tendances des CPUE de la pêche commerciale.

Les données disponibles ne donnent aucune indication claire de la perspective qu'il faut adopter quant à l'état du stock. La baisse des taux de capture des relevés pourrait être attribuable à des facteurs autres qu'un déclin du stock, tandis que l'étude par marquage pourrait comporter un biais variable dans le temps qui masquerait une baisse de l'abondance ou l'étude pourrait être faussée par le non-respect des postulats du modèle.

Selon des indices de recrutement, les classes d'âge des années 1990 étaient moins importantes que celles de la fin des années 1970 et des années 1980. Des indices de recrutement des juvéniles indiquent qu'il aurait pu y avoir des classes d'âge supérieures à la moyenne en 1998-1999, mais leur importance relative n'apparaîtra pas dans la pêche avant 2004 environ.

Le Sous-comité en arrive aux conclusions suivantes : 1) la population est faible; 2) il n'existe aucune préoccupation immédiate quant à la conservation; 3) il y a lieu de réduire les quotas. Manquant de fondement clair pour choisir entre les deux interprétations contradictoires quant à l'état du stock, le Sous-comité recommande que les indicateurs du stock soient à peu près également pondérés, ce qui donne une production de 2 100 à 4 000 t. Le Sous-comité remarque qu'une production de 2 800 t se situe près du milieu de la fourchette allant de 2 100 à 4 000 t et correspond à un taux d'exploitation de 0,08, soit la valeur maximale pour une réduction appropriée, selon le document de travail. Les gestionnaires peuvent se servir de cette information pour prendre leur décision. Cette recommandation s'applique au reste de la saison de pêche actuelle et à la saison 2002-2003.

INTRODUCTION

The PSARC Groundfish Subcommittee met January 29, 2002, at the Pacific Biological Station in Nanaimo, British Columbia. External participants from the Canadian Groundfish Research and Conservation Society (CGRCS), Canadian Sablefish Association (CSA), and the Sierra Club of B.C. attended the meeting. The Subcommittee Chair, A. Cass, opened the meeting by welcoming the participants. During the introductory remarks the objectives of the meeting were reviewed, and the Subcommittee accepted the meeting agenda.

The Subcommittee reviewed one Working Paper. A summary of the Working Paper is in Appendix 1. The meeting agenda appears as Appendix 2. A list of meeting participants, observers and reviewers is included as Appendix 3.

DETAILED COMMENTS FROM THE REVIEW

G2002-01: Review of survey, commercial fishery, and tagging data for sablefish *(Anoplopoma fimbria)* in British Columbia.

A.R. Kronlund, M. Wyeth, and R. Hilborn **Accepted subject to revisions**

Rapporteur: J. King

Fishery-independent survey indices

The Subcommittee agreed that survey catch rates for both the northern and southern stocks showed a decline from the 1990s to a relatively stable period beginning in the mid-1990s until 2000. The 2001 survey mean and medians are the lowest in the

series. Seven of the nine survey localities show declines in catch rates from the early 1990s to 2001.

Discussion ensued about the relevance of the survey data and the interpretation of trends. One interpretation based on Figure 5 of the Working Paper (reproduced as Figure 1 in Appendix 1) was that survey catch rates were stable from the mid-1990s to 2000, and that 2001 represents an abrupt drop in catch rates. The Subcommittee noted that other treatments of the data illustrated a continuous decline since 1992. A reviewer proposed that a stratified analysis, or a General Linear Model (GLM) analysis might help to elucidate the differences inferred from the two interpretations of the data and help to resolve if the decline has been continuous or is a step function.

The Subcommittee agreed they could not distinguish between a low and stable trend from 1994 to 2000, or an overall downward trend. However, the interpretation regarding stock status does not differ between the two possible interpretations of the time series: the stock is at low levels. The results of the 2001 survey heightened concerns that the stock may have declined in recent years.

The Subcommittee felt that the analyses presented were appropriate and thoroughly examined the data, and that the widespread decline over space and depth noted in the Working Paper was a reasonable conclusion. The Subcommittee acknowledged the alternative explanations put forward in the Working Paper for the decline in survey catch rates. These are: (i) a dramatic decline in stock abundance; (ii) local depletion at survey sites; (iii) a decline in availability; (iv) an anomalous 2001 survey point; and (v) bias in survey indices in the stable 1996 to 2000 period, masking the true downward trajectory in the series.

Industry noted that a survey trip will be like a fishing trip, there will be trips in which the catch rate is poor for various reasons that are unknown. It was suggested that potential bias in the survey that could make the 2001 data anomalous might be the quality of the bait used or a change in preference for prey. However, the Subcommittee noted that commercial CPUE in some survey localities also dropped, indicating that the quality of bait used in the survey is not a likely factor. The evidence presented in the Working Paper indicated that the survey was not influenced by commercial fishing effort before or during the survey time period in 2001 relative to any other survey year. In 2001, the trawl fleet interception of sablefish on the shelf occurred later in the year than normal, and sablefish did not appear to migrate to deeper depths. This observation raised the possibility that the survey might have been conducted too early to intercept sablefish at depths where they have been available in previous years. However, it was noted that the survey is conducted at shallow depths as well as deeper depths, and poor catch rates were observed in all depth strata.

The Subcommittee agreed that based on the evidence presented, the 2001 survey results were not anomalous due to departures from prescribed survey procedures or

logistical difficulties, and reflected the availability of sablefish in B.C. waters at the time of the survey. The survey results likely reflected a change in the availability of the fish and not bias in survey design. One explanation for a reduced stock in B.C. was a lack of fish immigration from Alaska in 2001. One reviewer noted that the abundance trend for eastern Gulf of Alaska sablefish, matched the decline observed in British Columbia. The Subcommittee also agreed that the 2001 survey results did not indicate a stock failure.

Commercial trap fishery CPUE

The Subcommittee concurred that the trends in the commercial data show a remarkable similarity to those observed in the survey data. The Subcommittee acknowledged concern when using fishery-dependent data to assess stock trends because of bait-loading in traps, changes in fishing practices in the late 1980s prior to the introduction of IVQs in 1990 and the introduction of escape rings in 1998. Discussion focussed on the possible effects on gear selectivity introduced by the adoption of escape rings in 1998.

There was concern that the introduction of escape rings has reduced the number of fish caught in traps, thereby interrupting the commercial CPUE time series. Some participants argued that we now have two series, one of which starts in 1998. It was noted that the selectivity of the escape ring sorts the catch by size class, something the fishermen would have done on board prior to the introduction of the escape ring. One suggestion was to evaluate potential bias from escape rings by examining the biological data from sales slips to determine the effects of escape rings on the size of fish retained.

The sablefish fishery experiences an annual seasonal increase in CPUE during December to February, primarily in northern B.C. This did not happen in 2001 and might have influenced the annual CPUE measurement. The lead author agreed to place a table in the document that would allow for the interpretation of seasonal changes in CPUE. However, the Subcommittee pointed out that part of the CPUE analysis focused on September to November so that the trend would not be biased by a decline in the 2001 winter CPUE.

The Subcommittee further noted that the catch in the current fishing year was lower than comparable months in the five previous fishing years and possibly reflected the low influx of Alaskan fish during the spawning season. The lead author was concerned that the fishery was relying on Alaskan fish and that we might not have an accurate estimate of the status of the northern B.C. resident sablefish.

Sablefish industry representatives agreed that catch rates experienced in 2001 were decreased relative to those observed prior to 1996. They noted that catch rates had improved in late December 2001 and January 2002 prior to the closure. The Subcommittee postulated that 2002 may have witnessed a more typical influx of Alaskan fish or a change in fishing behavior initiated by fears of reduced quota or closure.

Tag release and recovery analyses

Sablefish stock assessment has relied primarily on the results of tagging analysis in recent years. The updated tagging analysis presented in the Working Paper is based on all 2001 data rather than the data only available through April 2001 as reported in the November 2001 PSARC review. The resulting biomass estimate of approximately 37,000 t in 2001 is close to the 1995-2000 mean of 35,000 t and is consistent with the estimate reported in the November 2001 assessment. The Subcommittee agreed that contrary to the fishery-independent survey and commercial CPUE data, the 2001 tagging analysis does not suggest a dramatic decline in sablefish abundance from 2000 to 2001.

An analysis of fish exchange between Alaska and B.C. was conducted based on tag-recovery information. The Subcommittee was concerned that alternative scenarios in the tag recovery analysis designed to account for the differences in recovery rates in Alaska and B.C. do not include all plausible possibilities. For example, a reviewer pointed out that the exclusion of age-specific migration rates may be significant, and therefore, the 'buffer' of sablefish postulated in the Working Paper that migrate from Alaska to B.C. might be affected by current patterns of recruitment.

Figure 13 of the Working Paper (reproduced as Figure 2 in Appendix 1) summarizes the results of the updated tagging analysis and includes the percent tags returned in the year after tagging, estimated abundance by year and harvest rate by year. An explanation for the drop in the tag return rate in 1998 was the decline in the total catch (trap, trawl and longline) and the decline in trap removals as a percentage of total catch.

The Subcommittee agreed that the tagging analyses were vulnerable to criticism because the data do not meet model assumptions (e.g., random application of tags). The data may be useful to elucidate trends but the Subcommittee concurred that the absolute biomass estimates are biased. An abundance estimate that is not biased, requires the random release of fish or the complete mixing of fish; neither condition applies to B.C. sablefish. It was noted that the precision of the biomass estimate was not very good (probably plus or minus 30-50%).

The Subcommittee discussed the observation that fish tagged in the north were larger than those in the south, and that the recovery rates between the two areas were different. Difference in size (and perhaps age) infers that there are different chances of being recovered in the years following tagging. In future analyses, standardization of recovery data for size composition differences between the north and the south might be informative.

Sablefish biomass estimated from a longspine thornyhead 2001 trawl survey

The Subcommittee discussed the utility of the longspine thornyhead (LT) survey for estimating sablefish biomass. The working paper included an analysis that considered a range of assumptions about catchability and percent area surveyed.

The catchability assumption can greatly bias the estimate, and herding of fish by the net, sweeps, and doors that may cause catchability to be greater than 1.0 was not a scenario outlined in the paper. A catchability greater than 1.0 would result in biomass estimates lower than those presented in the paper. A reviewer noted that the depths of the survey are not comparable to those fished by commercial trap gear. He also commented that there was no citation or provision of survey design and methods that could be used to assess the suitability of the survey as a sablefish abundance index. The Subcommittee agreed that because the LT survey was not designed to catch sablefish the biomass estimate from the LT survey should not be used.

Recruitment indices

The Subcommittee concurred that the 'strong' year classes of 1990, 1995 and 1997 estimated for Gulf of Alaska sablefish were likely average, and not comparable to strong year classes in 1977 or others in the early 1980s. Those strong year classes resulted in the increased abundance observed in the mid-1980s. The mean recruitment of the 1990s has been below average when compared to a time series from 1960-1998, and from a historical perspective, there were no strong year classes in the 1990s. The Subcommittee noted that the early and mid-1990s reflected a lower productivity state, i.e., a different climate-ocean regime, and that the magnitude of strong year classes in the late-1970s was unlikely to have been generated in these years.

Indices derived from a juvenile sablefish survey in Hecate Strait, the IPHC set-line survey, and Hecate Strait assemblage survey indicate that there may be some above-average year classes in 1998/99. Their productivity will not be evident in the fishery until approximately 2004. The Subcommittee acknowledged the provision of qualitative information by industry that supports the presence of an above-average year class in 1998. The Subcommittee agreed that the recruitment indices should not be used in the formation of recommendations but that they do provide information that supports the current interpretation of stock status.

Advice to managers

The Subcommittee discussed the relevance of the harvest rates of 0.06 - 0.08 identified in the Working Paper. One view was that they are too conservative and sit at the very low end of harvest yield options presented in the November PSARC assessment. However, it was pointed out that if natural mortality is about 0.08, then justification of a harvest rate higher than natural mortality, particularly for a long-lived species like sablefish, is unwarranted and that harvest rates of 0.06 - 0.08 are

appropriate. The Subcommittee noted that the natural mortality rates reported are for the total stock and that the harvest rates reported in the Working Paper are for the vulnerable stock and therefore the two rates cannot be directly compared.

The Subcommittee agreed that for the current time period, a lower harvest rate is warranted. The reduction does not signal a change in the long-term harvest policy for sablefish, but represents a pre-emptive move until the contradictory information in stock indicators is resolved. Longer-term harvest policies would reflect the results of new data and analyses.

It was noted that the reduction in quotas recommended in the paper were comparable to the recent quota changes recommended for the eastern Gulf of Alaska where the estimated harvest rate is approximately 0.07.

The Subcommittee felt that the yield recommendations in the Working Paper were sound and supported by all of the data available. The adoption of a reduced harvest rate reflects heightened concern that sablefish may have declined from low levels of abundance observed beginning in the mid-1990s. The Subcommittee acknowledged that there is no indication of a conservation concern for sablefish.

Conclusion

The available data provide no clear indication of which view of stock status should be chosen. The decline in survey catch rates could be explained by factors other than a stock decline. Similarly, tagging analysis might possess a time-dependent bias that masks a decline in abundance or may be vulnerable due to known failures of the model assumptions. However, the two contradictory views of stock status can be used to bound yield recommendations.

Recommendations

The Subcommittee recommended that a reduction in the current 2001/2002 quota be implemented because of concerns raised by the 2001 survey results. The contradictory indicators of stock status suggest that the range in recommended yield be 2,100 t to 4,000 t. The 2,100 t was considered overly pessimistic but reflects concerns that the survey data indicates a stock decline and is the result of applying the low end of the 0.06 – 0.08 harvest rate range identified in the Working Paper to the 1995-2001 mean 35,000 t biomass estimate from the tagging analysis. The upper range of 4,000 t was considered overly optimistic given the new assessment but corresponds to a level considered appropriate per the November 2001 assessment. The Subcommittee recommended an approximately equal weighting of the two stock indicators. The Subcommittee noted that a yield of 2,800 t is near the middle of the 2,100-4,000 t range and corresponds to a harvest rate 0.08 identified in the Working Paper as the upper range for an appropriate reduction. Managers may wish to use this to guide their decision.

The Subcommittee recommended that the revised yield adopted for 2001/2002 be carried forward to the 2002/2003 fishing year, since no new data or analyses would be available prior to the August 1, 2002 start of the fishing year.

The Subcommittee supported the recommendation in the Working Paper to schedule the next assessment of sablefish for early 2003, rather than fall 2002, and cautioned against the pitfall of "chasing" the next survey point to determine stock status. The Subcommittee noted that all available data including commercial catch and effort, survey, tagging and biological data should be considered in the context of updated and new analyses developed for the next assessment.

APPENDIX 1. Working Paper Summary

G2002-01: Review of survey, commercial fishery and tagging data for sablefish (*Anoplopoma fimbria)* in British Columbia.

A.R. Kronlund, M. Wyeth, R. Hilborn

Catch rates observed during the 2001 sablefish (*Anoplopoma fimbria*) survey have declined significantly compared to those observed in the previous five years. In response, fishery managers requested a review of the 2001 survey data in the context of historical survey and fishery information, as well as an updated tag-recovery analysis. This paper was prepared as a supplement to the most recent assessment of sablefish (Haist et al. 2001) to accommodate the new survey information and to help evaluate whether the current assessment of sablefish stock status should be revised.

Survey catch rates showed declines from 1990 to 2001 in seven of nine localities and generally showed declines at all depth strata surveyed. The decline was steepest in the first half of the series, and slowed from 1996 to 2000. Catch rates in 2001 were the lowest in the time series, and generally exhibited much smaller variance in comparison to previous years (Fig. 1). Commercial catch rates calculated from logbook records showed trends similar to the survey data within the survey localities. Trends were less well defined outside of the survey areas, but suggested a decline from 1990 to 2001 and reduction in variance in the latter few years of the series. Interpretation of these trends is complicated by the adoption of escape rings in trap gear in 1998. Estimates from the tagging program for 2001 indicated a biomass of 37,253 t with an exploitation rate of 0.096. The estimates of abundance were without trend from 1995 to 2001, with no significant outliers evident within this period. The tagging program estimates showed no evidence of a dramatic decline in abundance from 2000 to 2001 (Fig. 2).

Recent assessments of sablefish in British Columbia have relied primarily on the results of tag-recovery analysis. This review of the survey index and commercial logbook data, prompted by the low 2001 survey result, lead to a reassessment of the relative weights assigned to different stock indicators.

The recommendation is that exploitation rates of sablefish coast wide should be targeted lower, with 0.06 to 0.08 being a more conservative stance than recent estimates from the tagging analysis. The lower bound of 0.06, which may be regarded as pessimistic, reflects the view that if the evidence for a decline in the survey index persists then harvests should be reduced roughly in proportion to the decline. This translates into a recommended yield of about 2,100 to 2,800 metric tonnes for the 2001/2002 fishing year, and represents a 30 to 48 percent reduction of the existing 4000 t total allowable catch for 2001/2002.

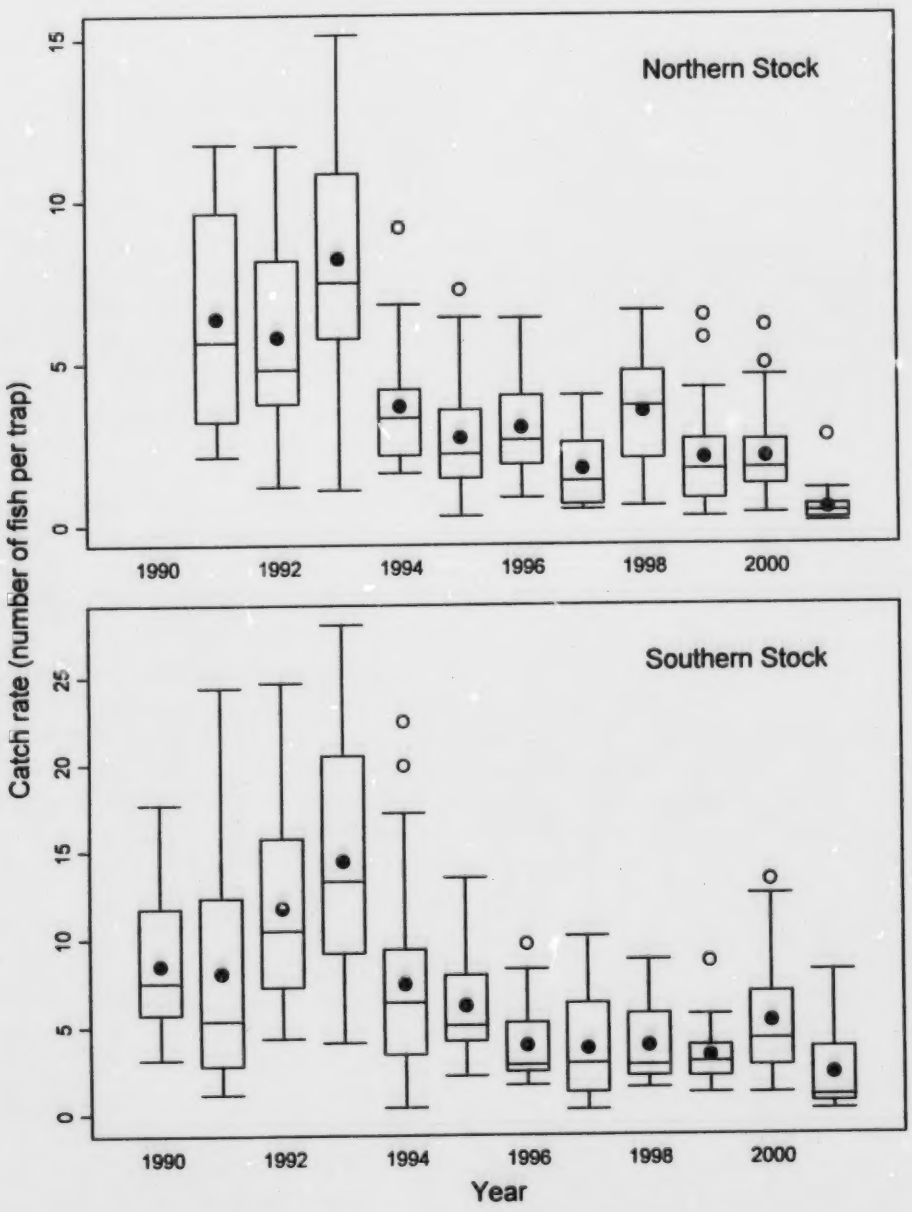
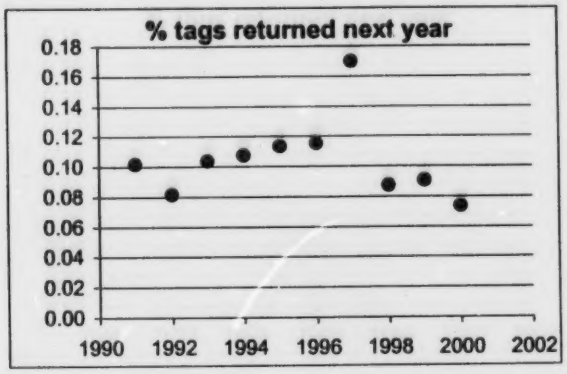
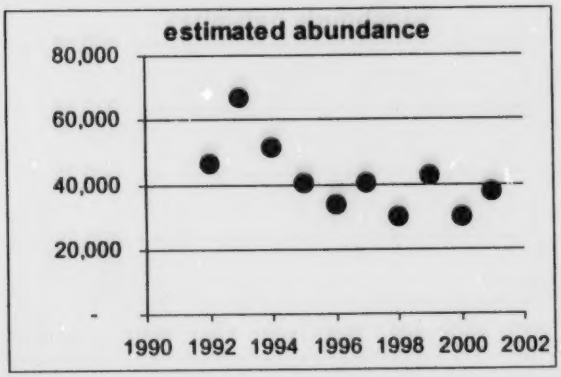


Figure 1. Distribution of sablefish survey catch rates (number of fish per trap) for each set by year and stock. Boxplots show the distribution of catch rates observed on each set. The filled circles show the mean annual catch rate. The lightly shaded rectangle indicates an approximate 95 percent confidence interval on the median annual catch rate.





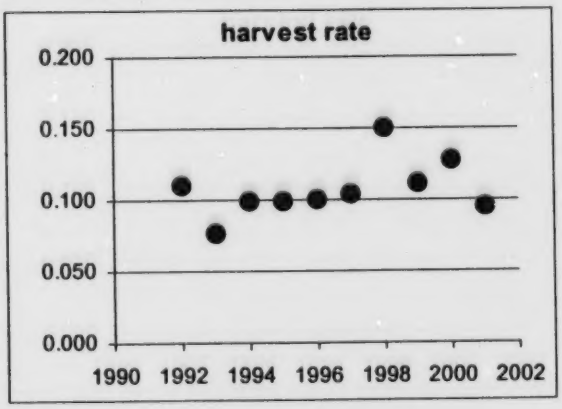


Figure 2. Percent tags returned the next year, total harvest rate, and implied abundance trends.

APPENDIX 2: PSARC Groundfish Subcommittee Meeting Agenda JANUARY 29, 2002

AGENDA
PSARC GROUNDFISH SUBCOMMITTEE
January 29, 2002

Pacific Biological Station
Seminar Room - Nanaimo, B.C.

Opening Remarks and Introduction	9:00am
Review of survey, commercial fishery, and tagging data for sablefish (*Anoplopoma fimbria*) in British Columbia (Supplement to the November 2001 sablefish stock assessment)	9:30 am
Lunch	12:00 pm
Other Business	2:00 pm
Adjournment	3:00 pm

APPENDIX 3. List of Attendees

Subcommittee Chair: Al Cass
PSARC Chair: Max Stocker

DFO Participants	Tuesday
* Subcommittee Members	
Ackerman, Barry*	✓
Eros, Carole*	✓
Fargo, Jeff*	✓
Haigh, Rowan*	✓
Haist, Vivian	Via phone
King, Jackie*	✓
Kronlund, Rob*	✓
MacDonald, Allan*	✓
Mathias, Karin	✓
McFarlane, Sandy*	✓
Perry, Ted	✓
Saunders, Mark*	✓
Sinclair, Alan*	✓
Stanley, Rick*	✓
Wyeth, Malcolm	✓
Yamanaka, Lynne*	✓
External Participants:	
Acheson, Chris	✓
Chow, Sharon	✓
Fraumeni, Bob	✓
Hilborn, Ray	Via phone
Mose, Brian	✓
Sigler, Mike	Via phone
Turris, Bruce	✓
Observers:	
Lane, Jim	✓

Reviewers for the PSARC papers presented at this meeting are listed below, in alphabetical order. Their assistance is invaluable in making the PSARC process work.

Sigler, Mike	NMFS – Alaska Fisheries Science Centre
Sinclair, Allan	Fisheries and Oceans Canada